



# Signal Range

The luminance levels in a scene are represented as amplitude levels in a recorded video signal. More exposure outputs higher signal levels. Overexposure eventually results in white clipping ? image areas with a signal level at the upper limit with no definition left. In analogue video, the signal amplitude is expressed as voltage or IRE units. In digital video, a set of discrete code values is used to represent the continuous luminance range (see Analog/Digital Conversion). The signal range defines upper and lower limit of the video signal representing the luminance values of black and pure white:

- Normal range (also called legal or safe range) signals use code values from 64 to 940 (0 ? 100%).
- Extended range (also called full range) signals use code values from 4 to 1019 (-10 ? 110%). As both ranges describe the same luminance-range in a scene, an extended range signal does not provide more dynamic range, but a finer gradation of the same dynamic range.



Normal range is commonly used for HD signals with 4:2:2 chroma sub-sampling. Extended range 4:2:2 HD signals are rather unusual. The use of extended range mostly improves the quality of black level reproduction. 4:4:4 HD signals use either normal or extended range.

The choice whether to use extended or normal range signals should not be made by the cinematographer alone, as it greatly depends on the options postproduction can offer. Material exposed without clipping in an extended range signal can still be clipped at 100% and/or 0% video level in postproduction, either due to unknowingly wrong settings or due to equipment limitations. This destroys important detail information in highlights and/or dark areas. Of course, the information can be recovered by ingesting the material once more. However, if the problem is based on equipment limitations it may require additional hardware. To save costs, it is therefore important to agree on a signal range in advance.



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